



Real-Time Data Capture and Adolescent Cigarette Smoking

Robin Mermelstein, Ph.D., Don Hedeker, Ph.D., Brian Flay, D. Phil., and Saul Shiffman, Ph.D.

Funded by grant CA80266 from the NCI and by a grant from the TERN, Robert Wood Johnson Foundation

Adolescent Experimentation with Smoking



- ◆ Most adolescents try cigarette smoking
 - 2002 MTF data show lifetime use among 12th graders = 57.2%
- ◆ But not all progress to regular smoking
 - 16.9% of 12th graders (MTF, 2002) report daily smoking
 - 9.1% of 12 graders (MTF, 2002) report smoking half a pack + per day
- ◆ Relatively little is known about factors that predict different trajectories of use beyond experimentation

Adolescents and Smoking: What We Need to Know

- ◆ Why do some youth who experiment with smoking progress to dependence, whereas others do not?
- ◆ In order to develop interventions that interrupt the progression from experimentation to dependence, we need to know more about the patterns and processes involved.



Goals of the Study

- ◆ To increase our understanding of the “natural history” of patterns of youth smoking from nonsmoking, yet “susceptible,” stages to more regular smoking
- ◆ To identify predictors of these trajectories of use
- ◆ To examine how adolescents’ subjective experience of early trials of cigarette smoking along with objective contexts influences their future smoking behavior

Why EMA?

- ◆ EMA is well-suited for measuring subjective states, intra-individual variability, and small shifts in mood.
 - Particularly useful in looking at subjective antecedents and consequences of smoking
- ◆ Ideal for studying the contextual patterns of smoking as well as subjective experience.

Characteristics of Adolescent Smoking Experimentation: Challenges of Using EMA

- ◆ Low frequency behavior when first trying
- ◆ Unknown intervals between cigarettes
- ◆ Behavior may be punishable, and therefore covert
- ◆ Behavior may be context-specific, high probability of occurring with peers in socially challenging situations
- ◆ Decisions not to smoke may be as critical to capture as actual smoking trials
- ◆ Adolescents are adolescents

EMA Design Considerations

- ◆ What was a realistic length of time (number of consecutive days) adolescents could carry around device and comply?
- ◆ What should be the interval between measurement waves?
- ◆ Fixed interval prompts vs random prompts vs event recording
- ◆ Length of each recording session/interview

EMA Data Collection via “ED” (Electronic Diary)

- ◆ 7 day monitoring period every 6 months for 18 months (4 measurement waves) via hand-held computers
- ◆ 3 types of “interviews”
 - Random Prompt - initiated by device which “beeps” subject, on average, 5-7 times a day
 - Smoke Events: subject initiated immediately after smoking episode (even a puff)
 - No Smoke Events: subject initiated when an active decision is made NOT to smoke when there is an opportunity to smoke

Making ED Compatible with Adolescents

- ◆ Issue of control over environment and time
- ◆ Situations in which data collection devices may not be feasible
- ◆ Need to program-in useful features
 - Suspend, Delay, Nap, Wake-up and Bedtime, Demos, Password protection
- ◆ Need to disable other features of palm pilot
- ◆ Use of “problem reports”
- ◆ Environmental Challenges
 - Noise level, breakage, appearance of device

Overview of Design:

Identification of Participants

- ◆ Goal to recruit youth who have not yet become regular smokers
- ◆ Brief screener administered in schools (N=18 schools) to identify 8th and 10th graders who fall into the early stages of cigarette use:
 - “Susceptibles” - never smoked, but indicate high “susceptibility” based on intentions
 - “Early Triers” - smoked within the past 90 days and have had no more than 20 cigarettes in lifetime
 - “Experimenters/irregular smokers” - smoked < 100 cigarettes in lifetime; Not yet daily smokers; May be “weekend smokers”
- ◆ 562 adolescents enrolled in study

Design Timeline

- ◆ Youth assessed 4 times: baseline, 6-, 12-, and 18-months
- ◆ Parents assessed at baseline and 12 months
- ◆ Multimodal approach to data collection
 - extensive self-report questionnaires at the beginning of a measurement wave
 - 7-day Ecological Momentary Assessments (EMA) through the use of hand-held computers
 - daily written diary reports of day's events during the 7-day EMA period
 - in-depth interview at the end of the 7 days

ED Training: Introducing the Project

◆ Teen Activity Project (TAP)

- Research study about the daily lives and experiences of teenagers
- Asks about things you do, people you are with, how you are feeling, and about cigarette smoking
- Not all participants are smokers

ED Training: Using the Device

- ◆ 40 minute individual or dyadic training session at baseline
- ◆ Explaining all functions and operations of device
- ◆ Role playing social situations
- ◆ Practicing with Device
- ◆ Review of Data output –e.g., compliance issues
- ◆ Hotline number for field problems
- ◆ 24-hour phone check-in by project staff
- ◆ Extensive debriefing at the end of the data collection week
- ◆ Retraining every data collection wave with corrective feedback from previous wave

Electronic Diary Interviews

- ◆ Mood
- ◆ Activity -- what doing
- ◆ Companionship -- with whom
- ◆ Presence of other smokers
- ◆ Place -- where?
- ◆ Eating/Drinking/Substance Use



Mood Questions

- ◆ Random Prompt

- *Think about how you felt just before the signal.*
 - » e.g., “Before signal, I felt happy”

- ◆ Smoke Event/No Smoke Event

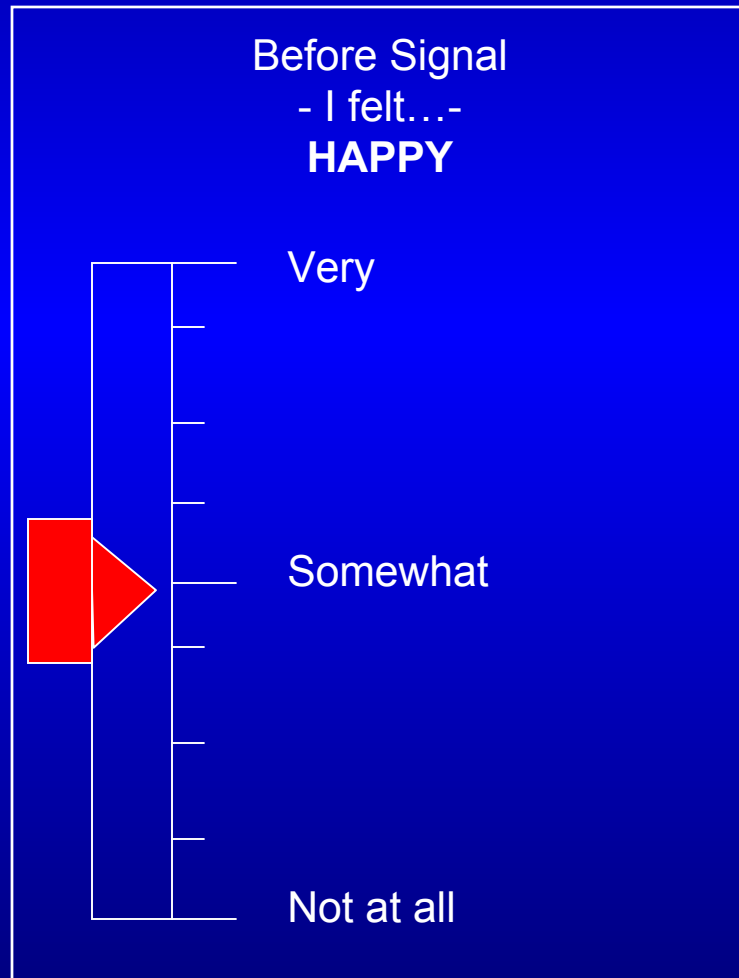
- *Think about how you feel right now.*
 - » E.g., “Right now, Do you feel happy?”
- *Now think about the time just before you smoked/decided not to smoke.*

- ◆ 1-10 Likert Scale

- 1 = not at all; 10 = very



Sample Random Prompt Questions



This screen is also used to measure these additional emotions:

- Lonely
- Tired
- Embarrassed
- Relaxed
- Sick
- Sad
- Stressed
- Angry
- Buzzed
- Cheerful
- Bored
- Frustrated
- Left Out

Sample Smoke Interview Questions

When Smoking
**How much did
you smoke?**

1 puff

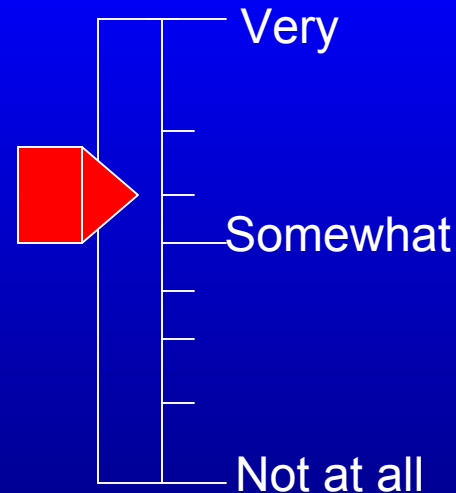
One

A few puffs

More than 1

Less than 1

When Smoking
**Inhale deeply into
lungs?**



Sample No Smoke Interview Questions

When decided

What did people say or do?

Encouraged smoking

Insulted me

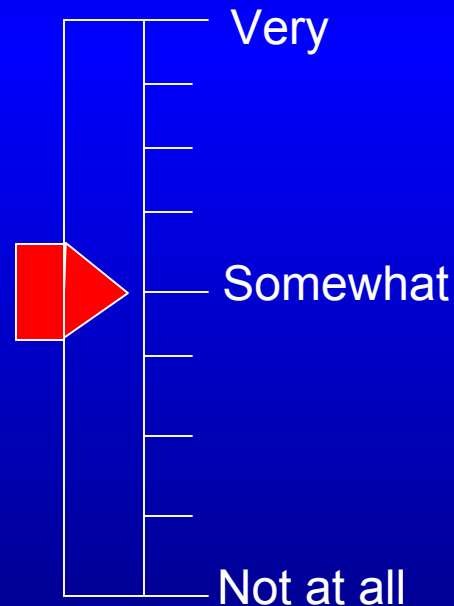
Supported me

Other

No one else around

When Decided

How badly did you want to smoke?



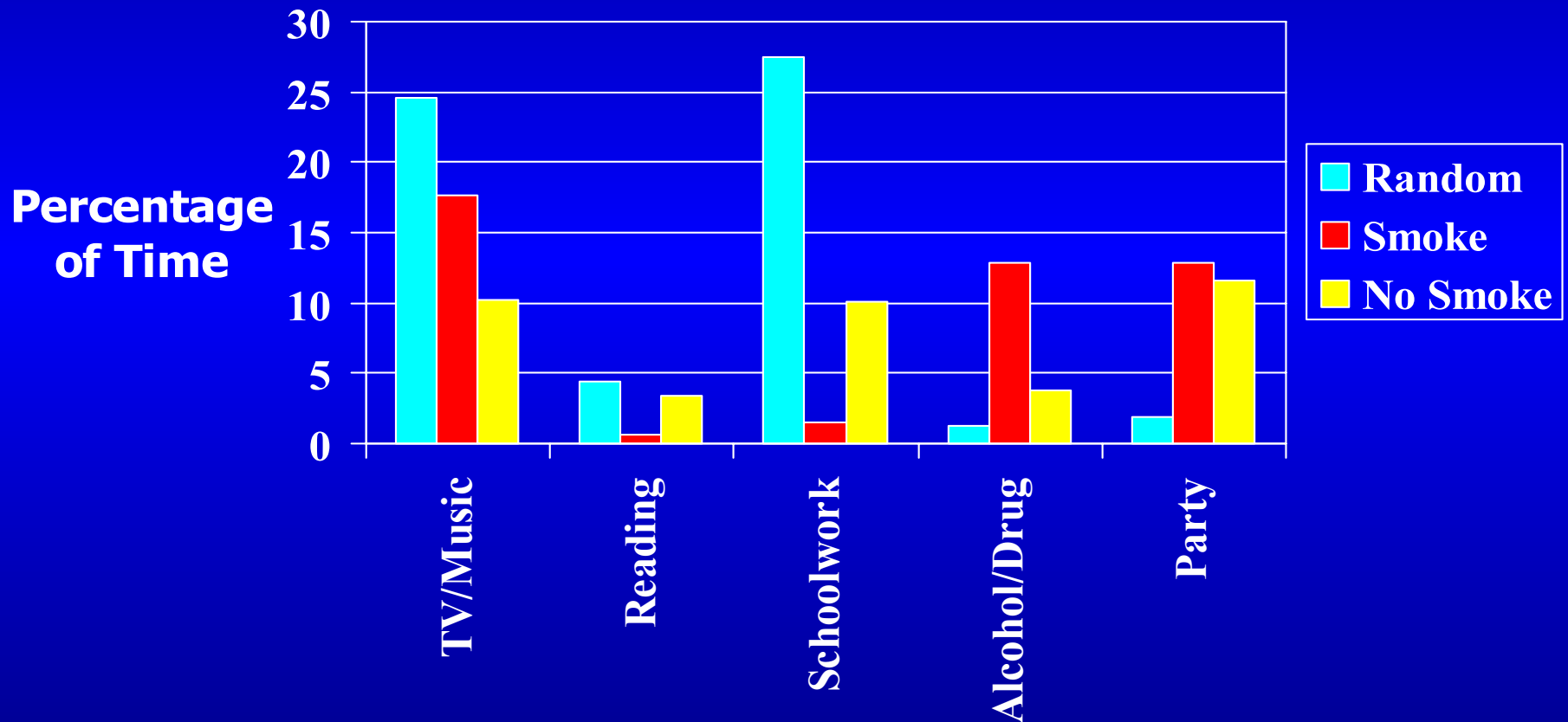
Compliance with EMA

- ◆ Mean number of random prompts answered = 33.5 (SD = 9.86)
- ◆ Mean number prompts missed = 5.7 (SD = 5.75)
- ◆ % prompts answered = 85% (SD = .14)
- ◆ 89% of prompts answered within 3 minutes
- ◆ Participant retention of 90% over 18 months
- ◆ Compliance did not significantly change over measurement waves

What are the objective,
situational contexts of adolescent
smoking?

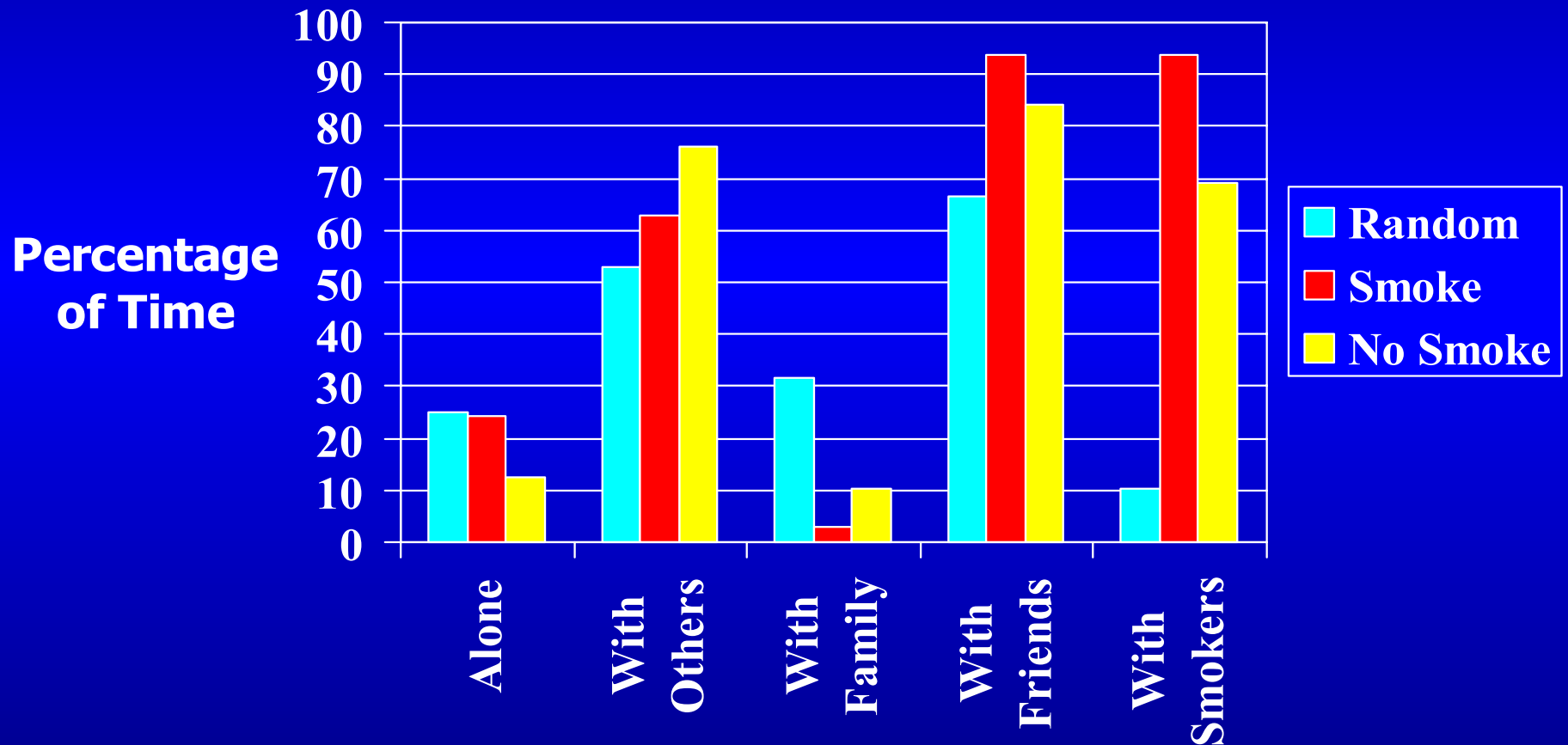


What Are Adolescents Doing When They Smoke or Decide Not to Smoke?



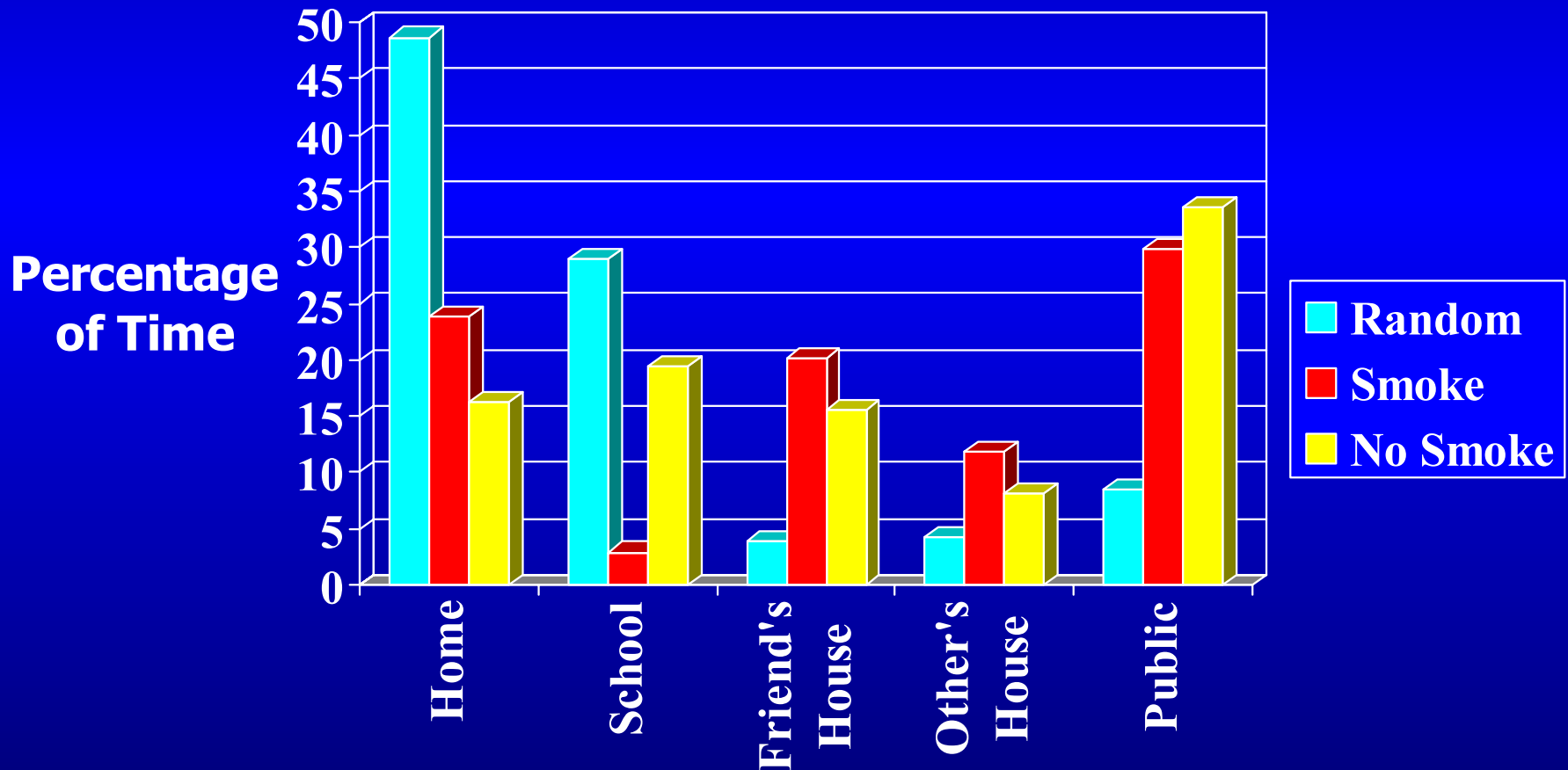
Note: Percentages do not sum to one hundred because participants were allowed to endorse more than one activity per interview.

Whom are Adolescents With When They Smoke?



Note: Percentages do not sum to one hundred because participants were allowed to endorse more than one companionship per interview.

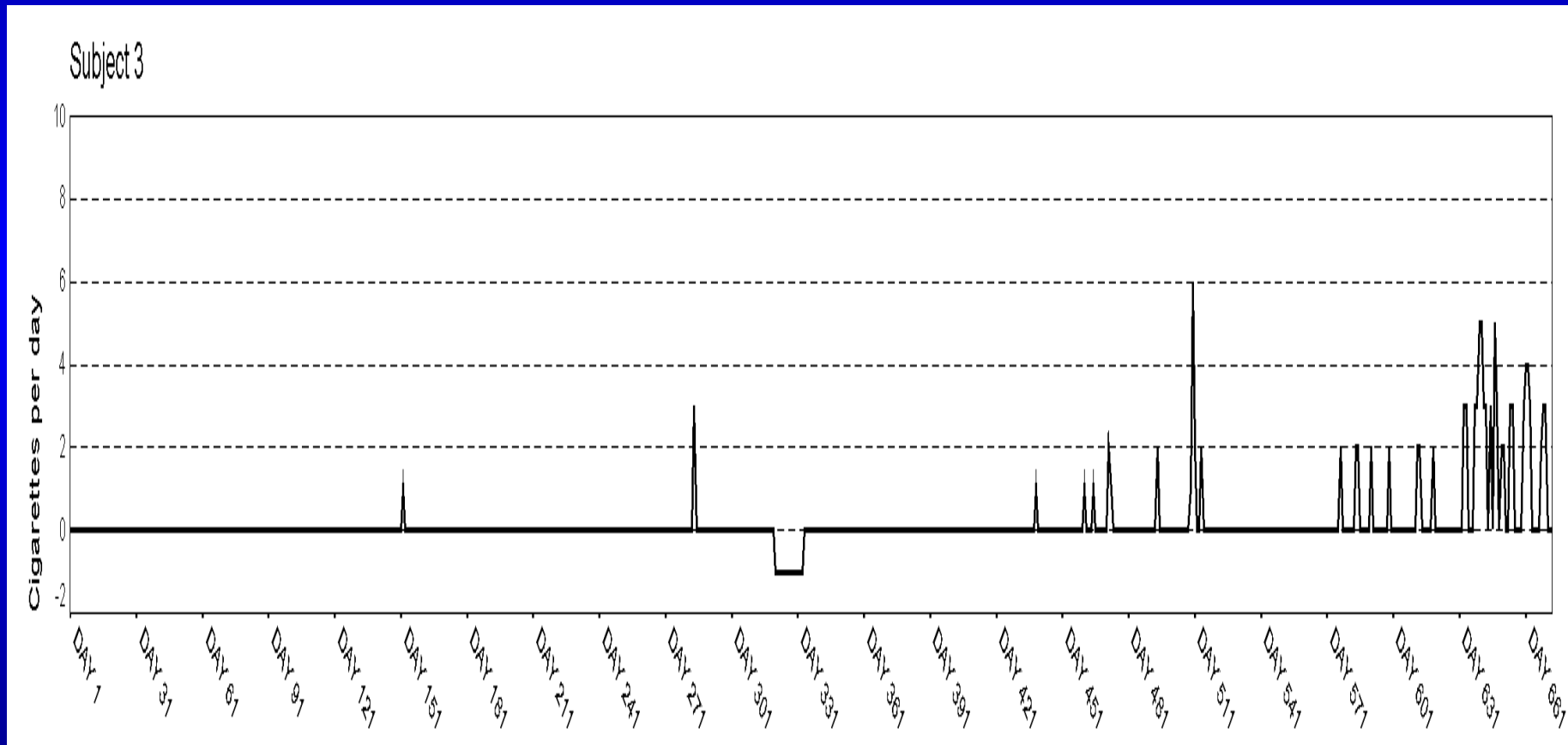
Where Do Adolescents Smoke?



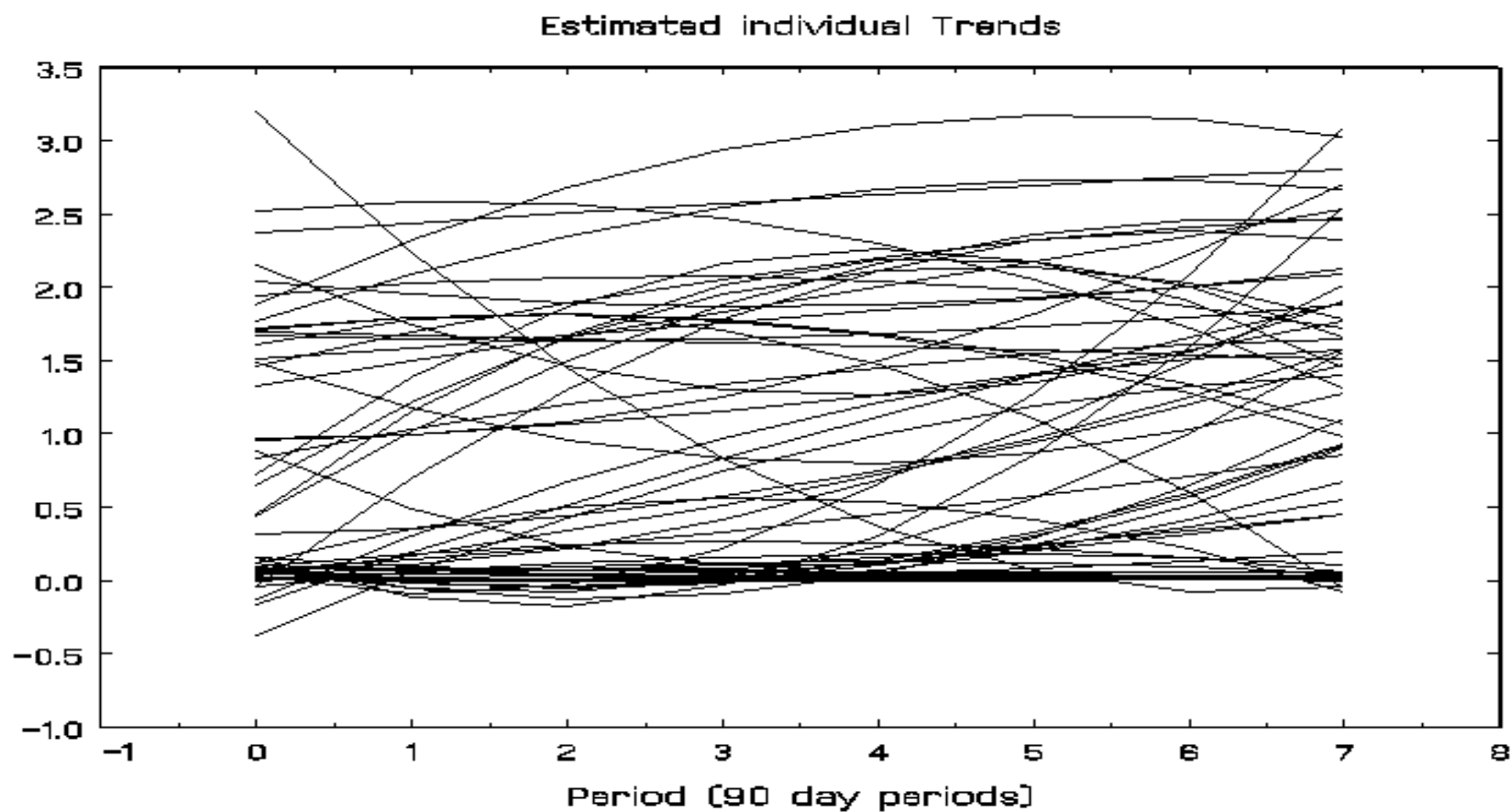
What are the longitudinal patterns or trajectories of adolescent smoking from susceptibility onward?



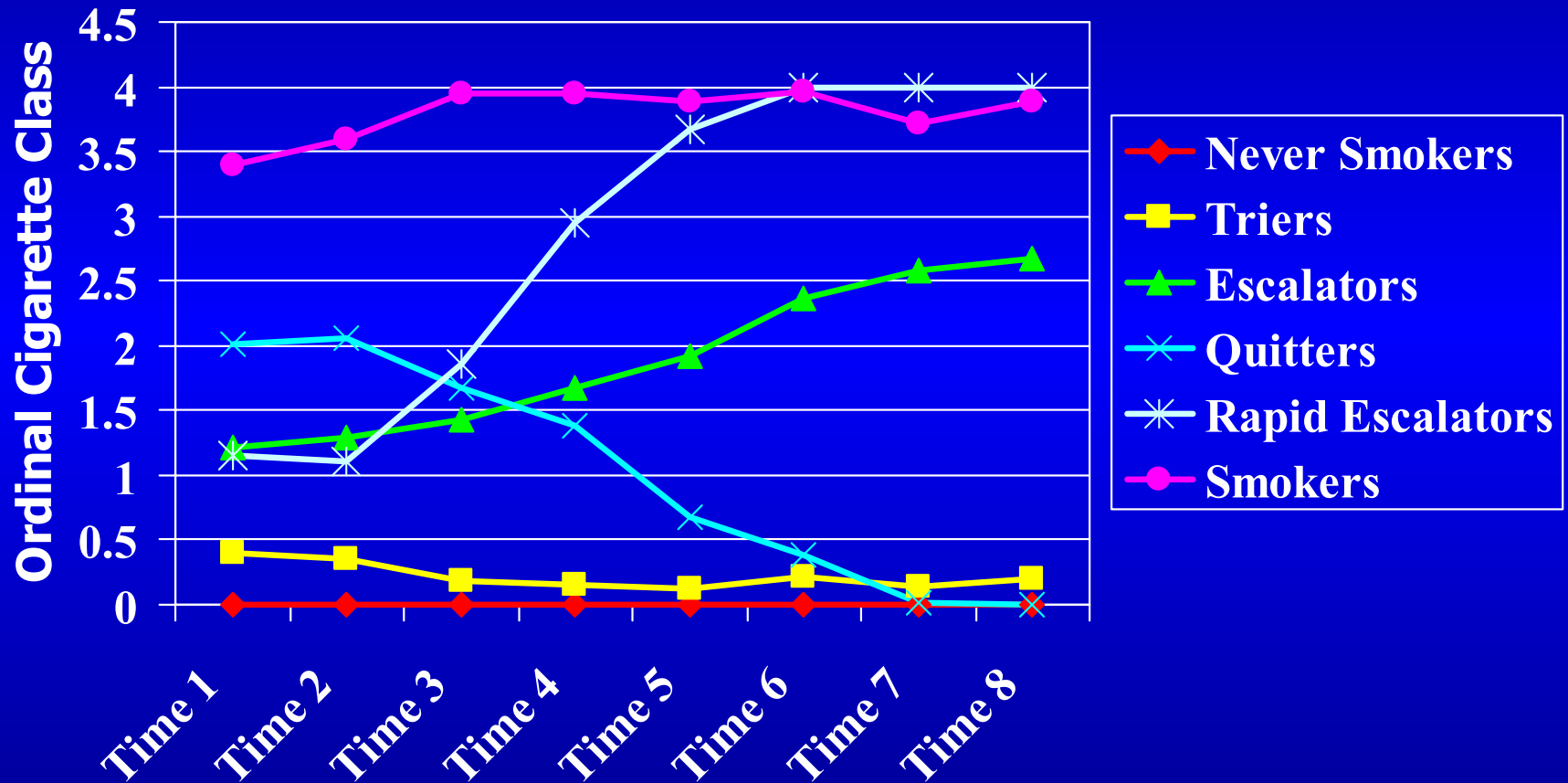
One smoking pattern over 2 years.....



Estimated Individual Trends



Longitudinal Patterns of Smoking



Do subjective responses to smoking predict trajectory?



- ◆ Do subjective, affective responses to smoking among adolescents early in their smoking careers predict longitudinal patterns of use?
- ◆ Specifically, we hypothesized that adolescents who experience greater mood benefits following smoking would be more likely to escalate in their smoking than adolescents who report fewer subjective mood improvements after smoking.

Mood Factors

- ◆ Positive Mood

- Happy, Relaxed, Cheerful

- ◆ Negative Mood

- Lonely, Embarrassed, Sad, Angry, Left-out

- ◆ Tired/Bored Mood

- Tired, bored

- ◆ Frustrated/Stressed Mood

- Frustrated/Stressed

- ◆ Physiological Reaction

- Sick, Buzzed

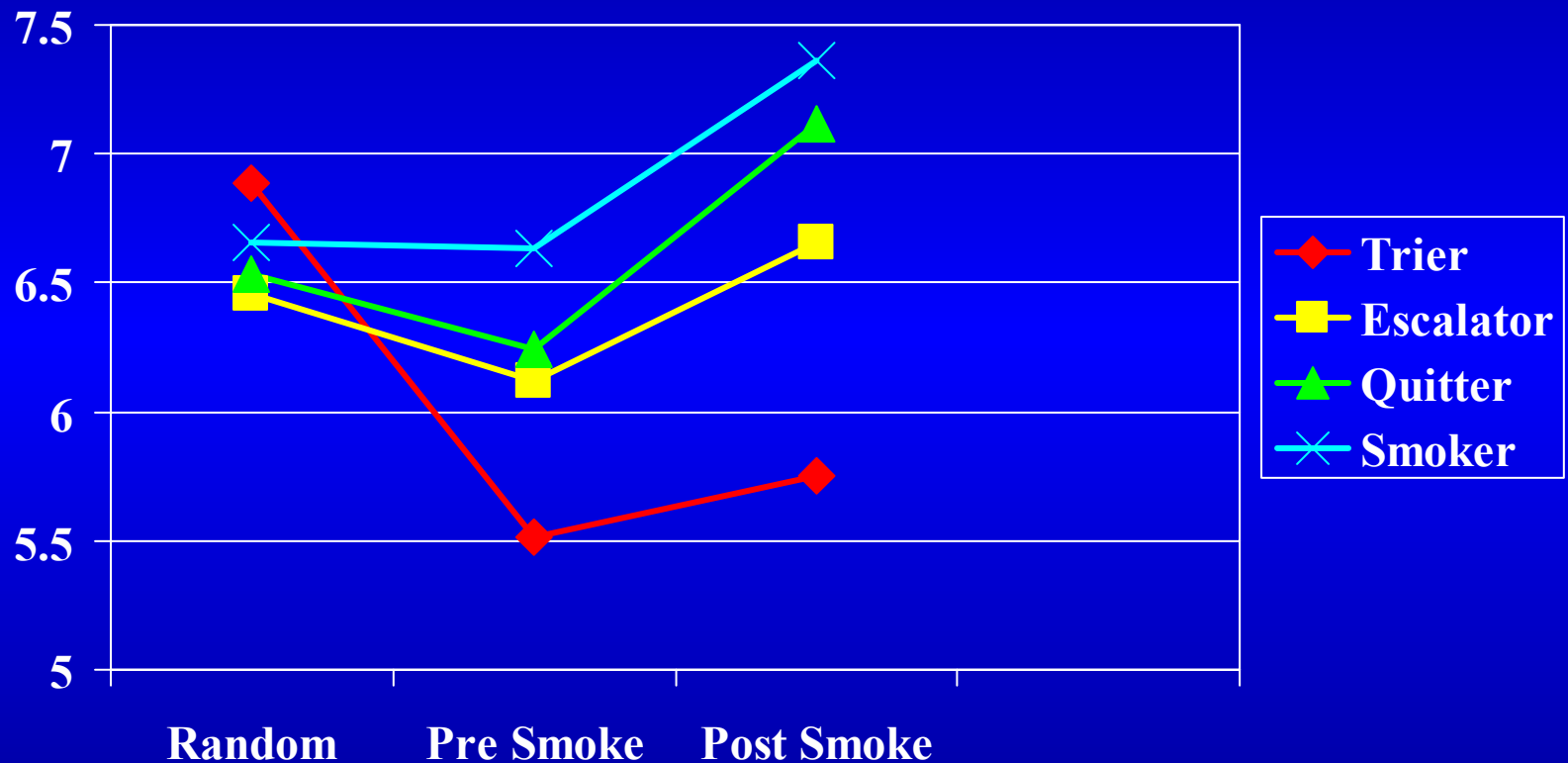
Do baseline moods from ED smoking data predict latent growth groups?

- ◆ Examine subjects who at baseline gave both random and smoke event data
- ◆ $N = 152$
- ◆ Look at mood scales
- ◆ Used 4 latent growth groups: triers, escalators (combined escalators and rapid escalators), quitters, smokers

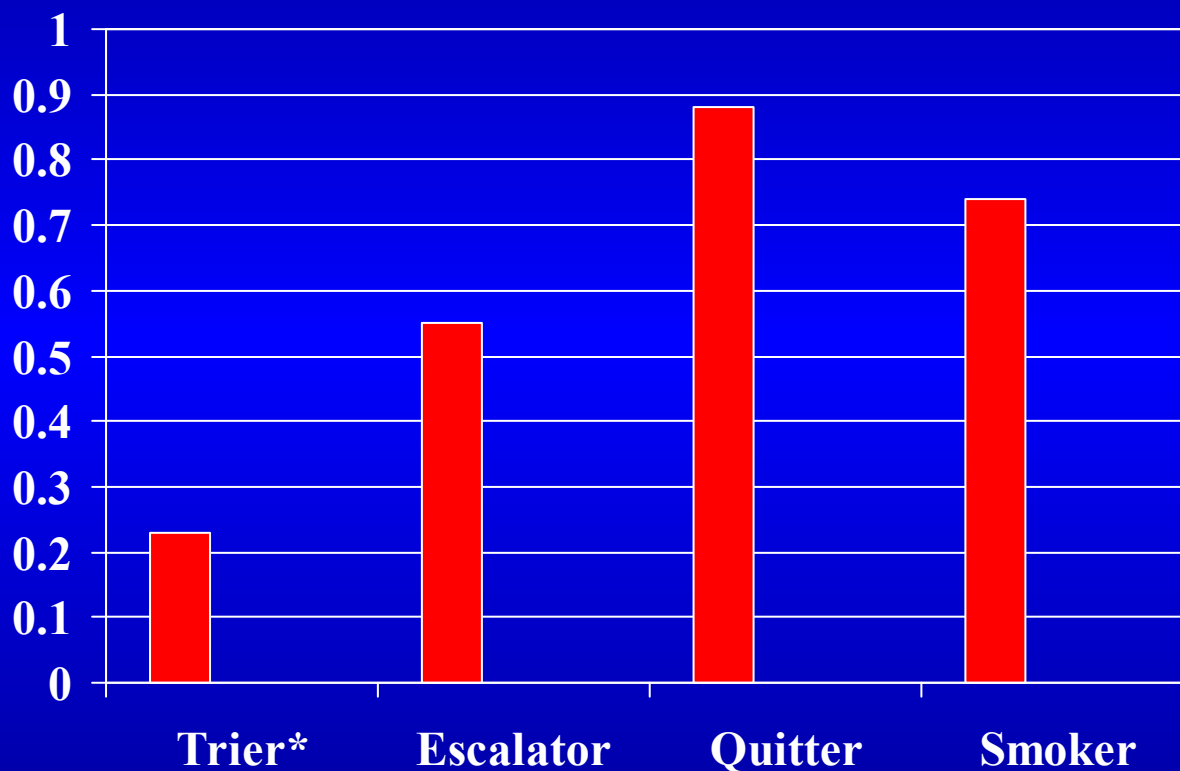
Analytic Approach

- ◆ Random effects regression analyses
- ◆ Controlled for gender and grade
- ◆ Examined main effect for “event” type: random vs smoke
- ◆ Examined interactions of event type by latent growth group separately for pre smoke and post-smoke

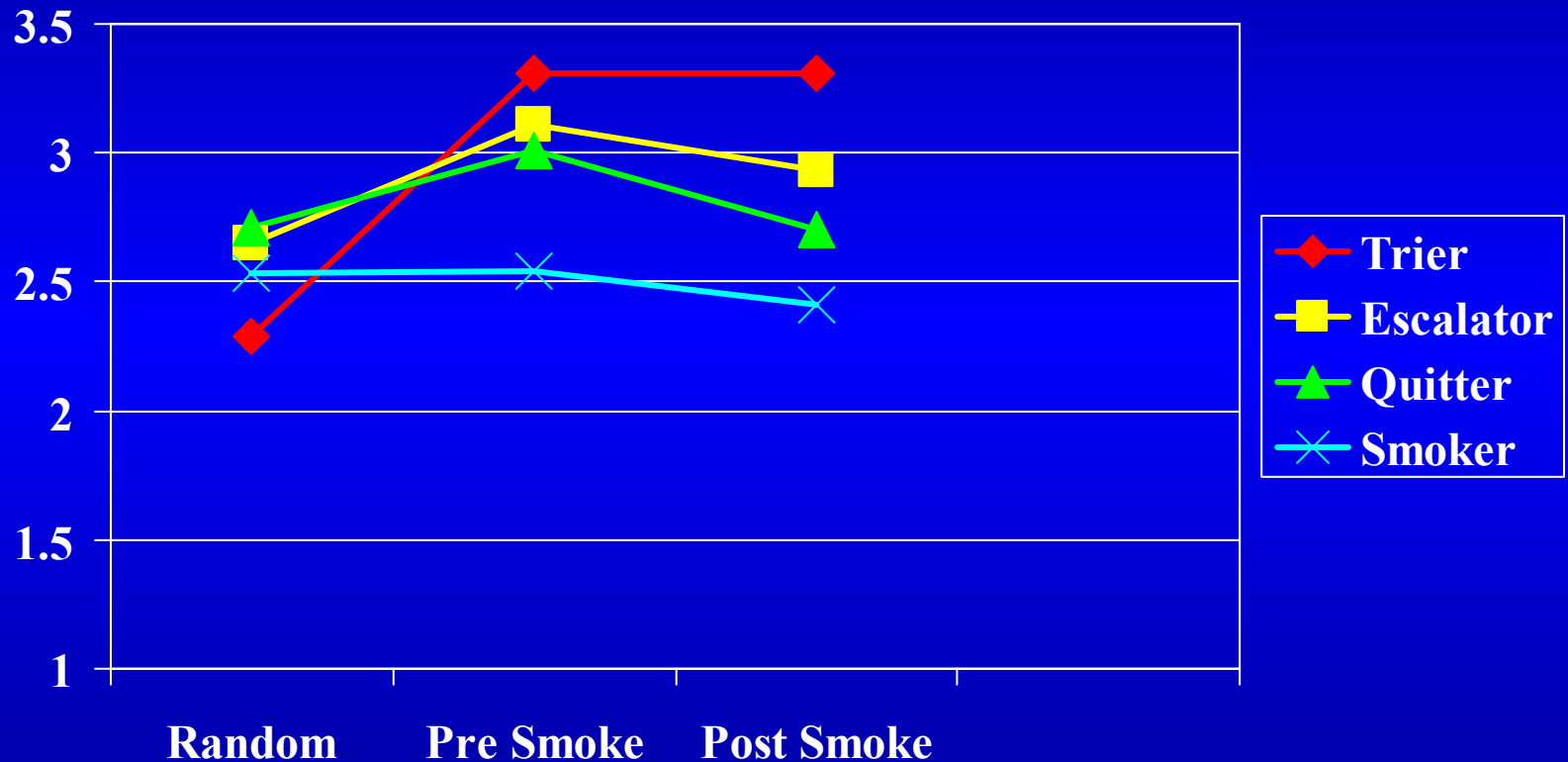
Baseline Positive Mood by Latent Growth Group



Changes in Positive Mood Following Smoking by Latent Growth Group



Baseline Negative Mood by Latent Growth Group



Changes in Negative Mood Following Smoking by Latent Growth Group



What Story Do these Data Tell?

- ◆ Many stories
- ◆ Subjective, affective responses to early trials of smoking can differentiate adolescents who try cigarettes and don't escalate (quit) from those who try and do escalate.



Lessons Learned

- ◆ EMA is a viable data collection method with adolescents
- ◆ EMA provides unique data that cannot be obtained through traditional paper and pencil questionnaire methods
 - E.g., examination of subjective responses to smoking and situational variability
- ◆ Pilot work was critical to working out field dilemmas!